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This report was prepared principally by

Reuben H. Moller
General Manufactures Division

Office of Industries

Norris A. Lynch, Director

Address all communications to
Office of the Secretary
United States International Trade Commission
Washington, D.C. 20436

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(202) 523-0161

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CONTACT: Ruben H. Moller
(202) 523-0381
USITC 77-031

U.S. INTERNATIONAL TRADE COMMISSION RELEASES A SUMMARY ON PHYSICAL TESTING MACHINES AND APPLIANCES AS ONE OF A SERIES OF SUMMARIES OF TRADE AND TARIFF INFORMATION

Information on U.S. imports, exports, and production and on world trade in physical testing machines and appliances became available today as the United States International Trade Commission released another report in its new, in-depth series of summaries of trade and tariff information.

The summaries of trade and tariff information are designed to meet the needs of wide and varied interests, including the Congress, the courts, Government agencies, importers, domestic producers, research organizations, and many others. The summaries contain accurate descriptions, in terms of the tariff schedules, of the thousands of products imported into the United States, and information on their methods of production, world supplies, and importance in trade and in the U.S. economy. The summaries also include substantive analytical material with regard to the basic factors affecting trends in consumption, production, and trade, and factors bearing on the competitive position and economic health of domestic industries.

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This report is being distributed to various Government agencies, congressional committees, and interested members of the public. In addition, as a service to the public, the field offices of the Department of Commerce and selected public and university libraries in large cities will be supplied with copies for commercial and professional consultation. Please address all communications regarding this report to the Secretary, U.S. International Trade Commission, 701 E Street NW., Washington, D.C. 20436.

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UNITED STATES INTERNATIONAL TRADE COMMISSION

SUMMARY OF TRADE AND TARIFF INFORMATION

Prepared in Terms of the
Tariff Schedules of the United States

Physical Testing Machines and Appliances

TSUS item 711.25

USITC PUBLICATION 841
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March 1978

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Tariff Schedules of the United States

Schedule 1 – Animal and Vegetable Products

Schedule 2 – Wood and Paper; Printed Matter

Schedule 3 – Textile Fibers and Textile Products

Schedule 4 – Chemicals and Related Products

Schedule 5 – Nonmetallic Minerals and Products

Schedule 6 – Metals and Metal Products

Schedule 7 – Specified Products; Miscellaneous and Nonenumerated Products

Schedule 8 – Special Classification Provisions

FOREWORD

Each Summary of Trade and Tariff Information is part of a series published periodically by the United States International Trade Commission to provide information on conditions of competition between domestic and foreign products and to include data on trade and development of U.S. industries. This report, covering the period of 1968 through 1976, represents one of many being published in the current series of summaries.

This series provides comprehensive coverage of product uses, manufacturing processes, and commercial practices, and provides analysis of the numerous factors affecting U.S. and world trade in each commodity area. The summaries are cast in terms of the eight schedules of the Tariff Schedules of the United States (TSUS).

The current series will consist of approximately 1,000 individual reports published in looseleaf form, which will enable the Commission to issue updated pages as appropriate for individual summaries. The overall program will run several years, ultimately covering all items of the TSUS.

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Executive Summary

The products covered in this summary consist of various heterogeneous machines, appliances and parts therefor (hereinafter referred to as "physical testing instruments" or "instruments") for mechanically determining the strength of materials or articles under compression, tension, torsion, or shearing stress. They are primarily medium to high technology instruments with diverse performance capabilities and capacities.

These physical testing instruments perform a key role in the development and advancement of industry and technology. In an advanced economy they provide the tools needed for fundamental and applied research and quality control. Such countries as the United Kingdom, Germany, Switzerland, Japan, and the United States are the major producers as well as users of these instruments. There are at least 20 known U.S. companies that produce these instruments, and, with the exception of a few specialty instruments, they produce a complete line of physical testing instruments. Generally, the major producers manufacture a variety of instruments with a wide range of performance capabilities and capacities, while the smaller firms tend to produce one or more specialty instruments with limited performance capability and capacity, and in some cases designed for one particular industry or for a single specific use.

Apparent U.S. consumption of these instruments increased over the period 1968-76 from an annual value of $22.4 million to $34.7 million, or by 55 percent. A significant part of this increase, however, was due to inflation. U.S. producers' shipments increased from $26.2 million to $45.5 million, an increase of 74 percent, while U.S. exports increased from $4.9 million to $13.5 million, an increase of 176 percent. During this same period, U.S. imports more than doubled, increasing from $1.1 million to $2.6 million, with the ratio of imports to apparent U.S. consumption rising from 5.0 percent to 7.6 percent. 1/

1/ Because of the wide variety of instruments included in this summary, quantity data are meaningless; therefore, data are only presented in terms of value.

Description and Uses

Description 1/

Commodity	TSUS item
Machines and appliances for determining the strength of articles, and parts thereof----------	711.25

Note.--For the statutory description, see excerpt from the Tariff Schedules of the United States Annotated (TSUSA) 1976, in appendix C.

The products covered in this summary are testing instruments for mechanically determining the physical properties of materials and articles. 2/ Physical testing instruments are primarily medium to high technology products and they have diverse performance capabilities and capacities. They are used for determining the tensile strength, hardness strength, compressibility, elasticity, rupture, fatigue strength, torsion factor, flexure, and similar physical properties of metals, wood, concrete, plastics, rubber, textile, paper, and other materials and products thereof. 3/

The end use of the instruments determines their size, design, construction, capability, and capacity. There are standard and custom-designed portable, bench, and floor type instruments which range from very small and delicate precision instruments to heavy-duty types with a capacity of measuring up to 10 million pounds of pressure.

There are a multitude of different kinds of physical testing instruments on the market and they differ widely in the degree of scientific sophistication involved. Some are simple instruments, limited in scope and application, others may have a complex built-in automatic control system(s) to assure highly controlled test performances. Many universal instruments contain removable assemblies and/or accessories which enable the instruments to perform a greater variety of tests with different types and sizes of test samples. Machines produced in recent years may give the end users a choice of dial indicator or digital readout, and some instruments can be calibrated to show the test results in pounds, kilograms, newtons, or all three. Instruments with integrated auxiliary accessories such as counters, recording devices, and other accessories are also available.

1/ For concordance of TSUS item No. 711.25 with related statistical categories, see app. A, table 5.

2/ The term "mechanically" is applicable to all testing instruments that function by virtue of physical forces acting on solids, liquids, or gases to produce energy which is converted into measured motions.

3/ A partial list of testing instruments according to end use is shown in app. B.

The production process

The physical testing instrument industry tends to be more labor intensive than capital intensive. The majority of the production work force consists of medium to highly skilled workers. Automation or assembly line production techniques are not utilized in this industry owing to the emphasis on custom-made instruments rather than standard instruments, the wide range of performance capabilities and capacities required of the product, and the limited demand for a particular instrument. Standard instruments for which a limited but constant demand exists, such as the Rockwell 1/ and Brinell 2/ hardness testers, and other instruments, might be stocked by the manufacturers in small numbers in a semifinished or finished state. The availability of semifinished instruments allows the manufacturer to complete the product in a relatively short time to the buyer's specification.

The manufacture of physical testing instruments requires the assembly of a wide variety of parts, components, and accessories. A testing instrument consists basically of a frame, a control system, and a measuring system. The degree to which each of these major elements is purchased or produced by the manufacturer differs from one plant to the other. Some manufacturers build their own frames and various sections, while others acquire them in a semifinished or finished state. The degree to which the parts, components, and accessories are finished or assembled at the time of purchase also differs among the instrument makers.

The production processes and the reliance on subcontractors varies according to the type of machine produced, the production capabilities, the availability of a professional and skilled labor force, and other considerations. However, regardless of the degree of reliance on subcontractors, most manufacturers still need men and machinery for cutting and machining of metals (milling, lathing, drilling, thread milling, and so forth), welding, sheet metal working, soldering, galvanizing, metal spraying, electroplating, and other processes. The actual assembly of the end product may be done by one or more persons, depending on the type of product and the degree of sophistication. Generally, the welding, electronic, electrical, and other phases of assembly are done by different individuals, each skilled in a particular operation.

Uses

Physical testing instruments are essential tools in technically-oriented societies. The understanding of the physical properties of materials and products has paralleled the technological development and

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1/ A Rockwell hardness tester determines the hardness of material by utilizing a steel ball or diamond with a rounded point of a specified size, which is pressed into the material under a prescribed load.

2/ A Brinell hardness tester determines the hardness of a material by utilizing a steel ball 1 centimeter in diameter which is pressed into the material with a standard force.

advancement in the metal, plastics, paper, textile, construction, and other industries. The instruments are primarily used for fundamental and applied research and quality control. In broad terms, the instruments are used in many industries to test materials and products to determine their physical strength, their service life, their weaknesses and possible points of failure, and their reaction to different external conditions and environments.

U.S. Customs Treatment

The current rate of duty for physical testing instruments, which applies to countries receiving most-favored-nation (MFN) treatment is 7 percent ad valorem, as shown in the rate of duty column 1 (see tabulation below). The rate of duty column 2, applicable to imports from countries designated by the President as being under Communist domination or control, 1/ is 40 percent ad valorem (see app. C for a copy of schedule 7, part 2, subpart D of the TSUS).

TSUS item No.	Commodity	Rate of duty		GSP eligible article
		Column 1	Column 2	
711.25	Machines and appliances for determining the strength of articles or materials under compression, tension, torsion, or shearing stress, and parts thereof----------	7% ad val.	40% ad val.	yes

The historical development of duty rates from August 31, 1963 through the current rate of duty as of January 1, 1972, appears in app. A, table 1, which reflects trade agreement concessions negotiated under the General Agreement on Tariffs and Trade (GATT).

Instruments covered under TSUS item 711.25 are subject to preferential duty-free treatment granted to designated beneficiary developing countries under the U.S. Generalized System of Preferences (GSP) effective January 1, 1976, by Executive Order 11888, dated November 24, 1975.

Apart from the applicable rate of duty and conformance with safety regulations that apply to physical testing instruments whether imported or domestically produced, there are no other restrictions on imports of these devices. Moreover, there have been no statutory investigations regarding the granting of import relief on physical testing instruments since the TSUS became effective on August 31, 1963.

1/ Poland, Yugoslavia, and Romania have been accorded most-favored-nation (MFN) treatment by the United States.

The Domestic Market

The domestic consumer and product demand

Physical testing instruments are primarily used for fundamental and applied research and quality control. It is estimated that about 75 percent of the instruments are purchased for use by industry, the remainder by commercial and educational research facilities, and the Federal, State, and local Governments.

The demand for physical testing instruments is influenced by the need for progress in the development and application of materials and products to meet the more exacting standards and requirements set forth by industry and government. New technologies in various fields, especially in the space program and the construction of atomic power stations and vessels, have created increased demand for improved and more accurate physical testing instruments.

U.S. consumption

U.S. apparent consumption of physical testing instruments increased from $22.4 million in 1968, to $34.7 million in 1976 (table 2). Consumption increased each year during this period, with the exception of 1972 and 1974, when the value of apparent consumption dropped by about 5 percent and 12 percent, respectively, from the previous year. The average annual ratio of imports to consumption was 5.7 percent during the reporting period.

The success of the U.S. producers in marketing testing instruments can be attributed in part to the fact that they produce an almost complete line of standard and custom-built physical testing instruments or systems that are generally equal to or superior to foreign-made products, and that they provide essential after-sale service, such as timely repairs or calibrations and supply needed parts and components expeditiously.

U.S. prices

The type of end products sold by this industry does not lend itself to establishing clearly defined price ranges and there are insufficient price lists available that cover an adequate number and range of instruments over a period of years to permit a rational evaluation of price trends. As mentioned before, this industry produces standard and custom-designed portable, bench, and floor type instruments of various sizes, designs, construction, capabilities, and capacities. Most instruments, however, are made to order and are designed and constructed to meet the needs and specifications of the buyer. The majority of the manufacturers sell directly to the buyer. This selling practice lends itself to negotiated prices, especially for the larger and more sophisticated physical testing instruments.

Such instruments range in price from a few hundred dollars to thousands of dollars. A simple hand-operated tension-measuring device may cost as little as $245 and as much as $40,000 or more for a highly sophisticated machine with multiple capabilities and associated controlling and recording devices.

There is no great price disparity between domestic and foreign-made instruments. Most foreign-made instruments are produced primarily in industrialized countries; thus, labor, material, and other costs are generally comparable.

U.S. Production

The domestic producer

Physical testing instruments are classified under SIC product code number 3829. Because they comprise only a small part of that four-digit industry group, no statistical information is available from official statistics on the production of physical testing instruments in the United States, or on the industry that produces them. Consequently, the data utilized in this study were obtained from industry sources or developed from independent research by the Commission staff.

Currently, there are 20 known U.S. manufacturers of physical testing instruments, and they are listed in the table below.

Manufacturers of physical testing instruments: Location, year established, and parent corporation, 1977

Company	Location	Year Established	Parent corporation
Acco, Wilson Instrument Div.	Bridgeport, Conn.	1926	Babcock International, Inc.
Chatillon, John & Sons	Ken Gardens, N.Y.	1956	-
Clark Instrument Inc.	Dearborn, Mich.	1941	-
Detroit Testing Machine Co.	Detroit, Mich.	1929	-
Dillion, W.C. & Co.	Van Nuys, Calif.	1942	-
Forney Material Testing Equipment	Wampum, Pa.	1945	-
Instron Corp.	Canton, Mass.	1947	-
King Tester	King of Prussia, Pa.	1955	-
MTS Systems, Corp.	Minneapolis, Minn.	1963	-
Newage Industries, Inc.	Willow Grove, Pa.	1950	-
Satec System, Inc.	Grove City, Pa.	1956	-
Shore Instrument and Mfg. Co., Inc.	Jamaica, N.Y.	1907	-

Manufacturers of physical testing instruments: Location, year established, and parent corporation, 1977--Continued

Company	Location	Year established	Parent corporation
Soiltest, Inc.	Evanston, Ill.	1948	-
Suter, Alfred Co., Inc.	Orangeburg, N.Y.	1901	-
Teledyne, Gurley	Troy, N.Y.	1845	Div. of Teledyne
Tensitron, Inc.	Harvard, Maine	1935	-
Testing Machine, Inc.	Amityville, N.Y.	1931	-
Thwing-Albert	Philadelphia, Pa.	1899	-
Tinius Olson Testing Machine Co., Inc.	Willow Grove, Pa.	1880	-
Webster Instrument, Inc.	Los Angeles, Calif.	1946	-

According to the above table, several of the presently viable companies had their origins in the middle or late 19th century. During the past 20 or 25 years, there has been some shifting among firms in the industry--some have merged with others, some have gone out of business entirely, and some new producing companies have been formed--but the number of producing firms has remained relatively stable.

U.S. production levels and trends

As shown in table 2, U.S. producers' shipments of physical testing instruments increased from an estimated $26.2 million in 1968 to $45.5 million in 1976, or an annual average increase of 6.5 percent. With the exception of 1974, when the value dropped by about 4 percent from the 1973 level, shipments increased each year during the reporting period. It is believed that the decrease in total shipments in 1974 is attributable to the general economic recession that affected the United States and other countries.

Major producing areas

Both in terms of the number of producing firms and in terms of employment in the production of the instruments covered in this summary, the industry is concentrated in the Middle Atlantic States, with half of the producing firms--accounting for an estimated 80 percent of the total industry employment--being situated in these States. Leading producing states are Connecticut, Illinois, New York, and Pennsylvania.

U.S. producers' inventories

Data on U.S. producers' inventories of physical testing instruments are not available either from official U.S. statistics or from other sources. As pointed out previously, a variety of types of testing instruments are manufactured with many different capabilities and capacities. Because the demand for many types of these products is relatively limited, the majority of the instruments are made to order. Some inventories are maintained for standard types of instruments for which a limited constant demand exists, but inventories are generally not a significant factor in the industry.

U.S. employment

U.S. statistics on employment for the physical testing instruments industry are not available. Very rough estimates by industry sources put the present level of employment at 1,000 production workers. No reasonable basis exists for estimating year to year shifts or even the trend of employment in the industry over the past several years. It is believed, however, that employment has been relatively stable owing in part to an industry personnel practice of holding their skilled employees on the payroll over slack periods.

U.S. Exports

U.S. export levels and trends

U.S. exports of physical testing instruments increased from $4.9 million in 1968 to $13.5 million in 1976 (table 2). Exports expanded consistently over this period with the exception of decreases in 1971 and 1973 of about 7 percent and 4 percent, respectively. The sharpest annual increase occurred in 1972 when exports increased from $6.0 million in 1971 to $8.9 million in 1972, or by 48 percent, reflecting increased demand for U.S. instruments in a number of countries. The smallest increase occurred in 1976 when exports increased from $13.0 million to $13.5, or by only 4 percent. The average annual rate of growth of exports from 1973 to 1976 was 16.2 percent. If the current trend for January-July of 1977 continues, U.S. exports for 1977 should be about the same as for 1976.

The ratio of exports to shipments showed some fluctuation during the reporting period, by increasing from 18.8 percent in 1968 to 29.6 percent in 1976, or by 10.8 percentage points. The highest ratios occurred in 1974 and 1975, reaching 32.4 and 32.0 percent, respectively.

The foreign markets

The principal export markets for the physical testing instruments are the industrialized and developing countries. The industralized countries in the European Economic Community (EEC) and the European Free Trade Association (EFTA) communities purchased about 28.3 percent of U.S. exports in

1975 and 27.6 percent in 1976. The developing countries of Central America and South America purchased approximately 15 percent in 1975-76 (table 3). The principal markets for U.S. exports in 1968-76 were the following seven countries; Canada, United Kingdom, Mexico, France, Japan, Brazil, and West Germany. In 1976 their share of total U.S. exports of instruments was 55 percent.

Germany is the principal competitor of the United States in the European market by reason of tradition, location, duty-free privileges, and smaller shipping costs. Not only is there no duty on instruments manufactured and traded within the EEC and EFTA communities, but freight charges increase the sale price by only about 5 percent compared to average duty and freight costs for U.S.-made instruments of about 10 to 12 percent.

U.S. instruments enjoy a well established reputation for quality and reliability, and are most competitive in highly sophisticated instruments and systems. U.S. instruments excel where performance rather than price is the prime consideration in selection. The decline of the U.S. dollar in recent years has improved the competitive position of the U.S. instrument industry.

U.S. Imports

U.S. import levels and trends

U.S. imports of physical testing instruments increased from $1.1 million in 1968 to $2.6 million in 1976 (table 4). Imports showed no clear trend from 1968 to 1972 alternating between annual increases and decreases. By 1973, a consistent growth trend emerged with average annual imports increasing by 25 percent from 1973-76. The 1974-75 recession probably accounts for the small increase in 1975. Imports expanded sharply in 1976, by 52 percent. The sharp increase of imports in 1976 is attributable to large purchases of French instruments by one U.S. firm. If the current import trend continues, the 1977 estimated imports are expected to be considerably below the 1976 level.

Import impact

Imports in relation to shipments and consumption over the 1968-76 period remained relatively stable. The ratio of imports to shipments fluctuated only slightly, from a low of 3.4 percent in 1970 to a high of 5.8 percent in 1976. The pattern of imports to consumption was also relatively stable, ranging from a low of 4.2 percent in 1970 to a high of 7.6 percent in 1976 (table 2).

Approximately 80 percent of the instruments imported by the United States in 1973-76, after the United Kingdom joined the EEC, were from EEC and EFTA nations. Japan supplied from 6 to 9 percent of U.S. imports in 1972-75, and 11 percent in 1976. The two major suppliers during 1968-76

period were West Germany and the United Kingdom. In 1968-76, the Swiss share of the U.S. market trended steadily downward from about 22 percent in 1968 to 7 percent in 1976.

France, which had in prior years supplied only about 4 percent of total U.S. imports, expanded its share of the American market to 30 percent in 1976. Imports from France for the first 9 months of 1977 resumed the share of previous years of about 7 percent of total U.S. imports.

Imports and importers

An analysis of U.S. imports for 1975-76 indicates that all types of physical testing instruments were imported. The majority of the imported instruments fall below the $10,000 price range. It appears, therefore, that the imported products cannot be categorized as highly sophisticated and multipurpose instruments. About twenty importers appear to have been importing instruments on a regular basis. About six of the twenty U.S. producers of instruments also imported physical testing instruments and parts therefor. Two of these U.S. producers were large volume importers of instruments. Four of the importers are subsidiaries of foreign manufacturers.

World Trade

U.S. and foreign trade

The role that foreign trade plays in the United States is not only substantial, but is growing in importance. For example, the U.S. exports increased from $4.9 million in 1968 to $13.9 million in 1976; and the ratio of exports to shipments increased from 19 percent to 30 percent, respectively.

All member nations of the EEC and the EFTA are producers of physical testing instruments. West Germany and Great Britain produce an almost complete line of instruments, and are Europe's leading suppliers. Switzerland also is one of the larger producers of these instruments. For the remainder of the EEC and EFTA nations, domestic demand is not large enough to make domestic production of a complete line economically feasible. These nations, therefore, concentrate on manufacturing a limited group of instruments. Besides the United States, other countries of the world producing physical testing instruments are Japan, Canada, Brazil, Argentina, Mexico, and India. Of these other countries, only Japan can be considered a major producer, the rest being marginal.

In Europe, the EEC nations, consisting of France, the United Kingdom, the Federal Republic of Germany, Italy, Denmark, Ireland, Belgium, the Netherlands and Luxemburg, represent the largest free trade area in Europe in terms of value of trade. Greece and Turkey are associate members of EEC. In addition EEC has preferential trade agreements with more than 60

countries, primarily located in Africa and the Middle East. The EFTA nations, consisting of Austria, Norway, Portugal, Sweden, Switzerland, Finland and Ireland, represent another free trade area with a substantial volume of trade. In July 1977, tariffs were eliminated on industrial products traded between EEC and EFTA countries. Taken as a whole, the member countries of EEC and EFTA represent one of the largest groups of producers and users of physical testing instruments. In spite of the substantial showing of U.S. exports to these countries (about 30 percent of total U.S. exports), the existing free trade agreements between the EEC and EFTA nations, and the proximity of the European manufacturers to the users of instruments, place the American producers at a disadvantage.

There are numerous regional trade preference arrangements in various parts of the world, such as the Central American Common Market, Andean Pact, Latin American Free Trade Association, Caribbean Community, West African Economic Community, Gulf Common Market, the Bangkok Agreement, and many others. With few exceptions these nations are developing countries and do not have the capability of manufacturing physical testing instruments. Instruments that are manufactured in India, Mexico, and Brazil are primarily of limited scope and selection. It appears that U.S. exports to the developing countries are not significantly affected by the existing rates of duty, but rather by the relatively limited demand for testing instruments, exchange restrictions, and competition from Western European and Japanese manufacturers.

Major producing countries

A brief discussion of the physical testing instruments industry in the significant producing countries for which information could be obtained follows. Generally, statistics on physical testing instruments are not available, particularly those on production. In most cases statistics on these instruments are combined with other types of instruments with no distinction made between mechanical and electrical physical testing instruments. Therefore, in many cases, production must be estimated.

West Germany.--West Germany is the largest producer of physical testing instruments in Europe, surpassing all others in terms of quantity, value, selection, and capabilities. It produces a full line of such instruments. Although production figures are not available for this specific category of instruments, some estimates and assumptions can be made from other aggregate data. It is estimated that 40 percent of Germany's production is exported. The ratio of exports over imports is about 4 to 1. In 1976, exports increased by 6 percent over the preceding year. The geographical distribution of exports in 1975 and 1976 showed approximately 50 percent of German exports of instruments went to the EEC and EFTA nations, and 13 percent to communist nations of Europe, 5 percent to the United States and about 1 percent to Japan. German exports to the United States increased from $534,000 in 1975 to $743,000 in 1976.

In 1975 and 1976, the approximate distribution of Germany's principal import sources was as follows: 66 percent from EEC and EFTA countries; 18 percent from the United States, and 7 percent from Japan. In 1976 total

German imports of these items increased 13 percent over the preceding year. Sales of U.S. instruments to Germany, however, fell sharply in 1976. The value of German imports of U.S. instruments, declined from $763,000 in 1975 to $498,000 in 1976.

It is believed that German production of testing instruments remained relatively stable in 1975 and 1976. This sluggishness can be attributed in part to the strength of the German Mark (DM), the weakening of other currencies, and wage increases of about 12 percent in 1975 and somewhat less in 1976. The industry is also experiencing the effects of technological obsolescence with aging machinery and equipment, much of which dates back to 1966 and earlier. The competitive position of the German instrument industry has been affected by these factors which have contributed to its weakened position in world trade.

United Kingdom.--The United Kingdom is a major producer of physical testing instruments in terms of quantity, value, selection, and capabilities. It produces instruments for testing the physical properties of all major materials and many end products. Total production figures are not available.

One unusual characteristic of the British market has been pointed out and is recognized by the industry. Despite the fact that research and development in this area is active and significant, there is the anomaly that a large segment of British industry is reluctant to use advanced instruments. Therefore, a large proportion of their end products are exported. The ratio of exports over imports was 5 to 1 in 1975 and 4 to 1 in 1976.

The value of British exports of instruments was 13.0 million dollars in 1975 and 10.7 million dollars in 1976. The value of British exports of these instruments to the United States declined from $371,000 in 1975 to $350,000 in 1976.

The geographic distribution of British imports shows also, as with exports, the significant position of the European trading communities; 54 percent of the imports came from EEC and EFTA countries in 1975, and 41 percent in 1976. However, the two most significant supplying countries were Germany and the United States. Germany supplied 44 percent of British imports in 1975 and 32.4 percent in 1976. The share of U.S. instruments as a percent of total British imports of this commodity group rose sharply from 28.1 percent in 1975 to 44.9 percent in 1976, valued at $1,170,000 and $1,400,000, respectively.

Switzerland.--Switzerland is generally recognized as one of the significant producers of physical testing instruments in terms of quantity, value, selection, and capabilities. It produces a diverse line of testing instruments. Total production figures are not available.

The latest available export and import statistics cover 1974 and 1975. Switzerland's exports reached $8.1 million in 1974 and $8.3 million in 1975. Imports remained steady at $2 million in 1974 and 1975. In 1975,

approximately 35 percent of Swiss exports were marketed in EEC and EFTA countries, 24.1 percent went to European communist countries, 3.2 percent to Japan, 3.0 percent to Asian communist countries, 2 percent to the United States, and the remainder to other countries. The value of Swiss exports to the United States was $157,000 in 1974, $145,000 in 1975, and $181,000 in 1976.

The dominant position of the EEC countries in the Swiss market also is evident. In 1975, approximately 93 percent of Switzerland's imports came from EEC and EFTA countries. In comparison, the United States supplied 4.7 percent of Swiss imports, and European communist countries, 1.6 percent.

Various domestic factors have affected the Swiss economy in general which have in turn affected the condition of this industry. Rising wages in themselves have not been viewed as exerting excessive upward pressure on prices. However, because the Swiss franc has remained relatively stable while the dollar, and the pound, and to a lesser extent certain other currencies have softened, the attractiveness of Swiss products has declined for those foreign purchasers.

France.--The domestic industry of France supplies 34 percent of its annual demand of physical testing instruments. U.S. exports to France almost doubled between 1974 and 1975, from $432,000 to $856,000, respectively. The expansion continued in 1976 when such exports reached $1.1 million.

About half of France's production of testing instruments, or 52 percent, are exported. U.S. import documents indicate that instruments imported from France are predominately those designed for the textile industry. The United States purchased 2.4 percent of French exports in 1974, and 2.2 percent in 1975. The value of French exports to the United States fell from $64,000 in 1974 to $44,000 in 1975, but jumped to $784,000 in 1976.

The French instrument industry suffers from lack of capital investment, and real growth was only 2 percent in 1975. No significant increase in the growth rate is foreseen in the immediate future.

Sweden.--It is estimated that in 1975 Sweden produced $1.7 million of physical testing instruments. The Swedish industry is oriented toward the export market, exporting 80 percent of the instruments it produces. In 1975, Sweden imported about $1.8 million of instruments which about equaled the value of domestic output. Given these similar values of production and imports and the heavy export volume, it is concluded that Sweden produces a select and special group of scientific instruments necessitating substantial imports to satisfy domestic industrial demands. The United States supplied about 5 percent of Swedish imports of these instruments.

Other EEC and EFTA nations.--Very little, if any, information is available on the physical testing instrument industry of the remaining EEC and EFTA nations. It appears that all of these nations manufacture a small select group of instruments. However, the bulk of their needs are met by

imports principally from West Germany, the United States, France, and Great Britain. Japan's share seems to be relatively small and West Germany dominates the market.

Japan.--Statistics on production, exports, and imports of physical testing instruments are not available. Japanese sources combine statistics of physical testing instruments with other types of instruments, and alternative sources of data are not available. These limitations impose serious restraints on the analysis of the Japanese physical testing industry.

A review of U.S. import documents suggests that Japan produces and exports a wide range of instruments to the United States. It is believed, however, that many of the Japanese instruments are limited in scope and application.

The Japanese share of the instrument market of the EEC and EFTA nations is not significant when compared to German and U.S. sales in that market. Japanese exports to the United States increased from $160,000 in 1975 to $301,000 in 1976, but were considerably below Japanese imports of U.S. instruments of about a million dollars in 1975 and 1976.

Canada.--Canada is one of the smaller producers of physical testing instruments. Production figures are not available.

In 1975 and 1976, the ratio of imports over exports was about 9 to 1. The most significant countries supplying Canada in 1975 were as follows: the United States, 82 percent; Great Britain, 4.8 percent; France, 1.3 percent; and West Germany, 6.1 percent. This pattern of distribution changed somewhat in 1976: the share of the Canadian market supplied by imports from the United States dropped to approximately 77 percent, British imports dropped to 1.9 percent, and West Germany's share increased to 16 percent. Canadian imports of U.S. instruments reached approximately $1.9 million in 1975, and about $2 million in 1976.

The principal market for Canadian exports of these instruments is the United States but the value of such trade is small--$154,000 in 1975, and $59,000 in 1976. In 1975, 58 percent of Canada's exports of instruments went to the U.S. market, 5 percent to Great Britain, 23 percent to Japan, and the remainder to other countries. In 1976, 78 percent went to the United States, 8 percent to West Germany, and the remainder to other countries.

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Foreign customs treatment 1/

Physical testing instruments are dutiable at a wide range of rates throughout the world. The testing instruments are provided for under BTN number 90.22. The following table lists the countries for which appropriate information was readily available. 2/

Physical testing instruments: Current rate of duty and possible nontariff barriers, by country

Country	Current rate of duty (percent ad valorem)	Possible nontariff barriers to trade
Belgium 1/	6	18% value added tax.
France 1/	6	17.6% value added tax.
Federal Republic of Germany 1/	6	10% value added tax.
Ireland 1/	6	20% value added tax.
Italy 1/	6	14% value added tax.
Netherlands 1/	6	18% value added tax.
United Kingdom 1/	6	8% value added tax.
Austria 2/	10	18% value added tax.
Norway 2/	None	18% value added tax.
Sweden 2/	5	20.63% value added tax.
Switzerland 2/	None	45 Swiss francs for each kilograms; plus 8.4% sales tax.
Turkey	25	Imports are subject to licensing. 9% stamp tax based on c.i.f. value. 15% surcharge based on rate of duty. 5% port charge based on c.i.f. value, rate of duty, and customs surcharge. 10 to 25% production tax based on all the above and rate of duty.
Yugoslavia	16	Imports are subject to licensing.
Canada	15	12% Federal tax.
Argentina	65--based on c.i.f. value	2% tax based on c.i.f. value, if product is made of iron or steel. Certificate of necessity is required.

See footnotes at end of table.

1/ Information in this section has been obtained from a number of sources, and its accuracy cannot be assured. Many countries frequently change tariff duties and other factors affecting trade. Authoritative information if desired should be obtained from appropriate foreign governments.

2/ The percentage values given in the table should not be interpreted as being a tariff rate of duty.

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Physical testing instruments: Current rate of duty and possible nontariff barriers, by countries--Continued

Country	Current rate of duty (percent ad valorem)	Possible nontariff barriers to trade
Brazil	15--based on c.i.f. value	15% excise tax on dutiable value. A deposit representing 100 percent of the f.o.b. value must be deposited in a bank for 1 year without interest being paid. The above deposit can be avoided if foreign financing for a period of 5 years can be arranged. Import certificates are required, and documentation requirements are rigidly and strictly enforced.
Mexico	10	2% surcharge.
Venezuela	1	3.5% Customs Service tax.
Australia	6	A 3% preferential tariff is granted to commonwealth countries.
India	40	Imports are subject to strict licensing and exchange control. 5% auxiliary duty. Possible port charges and excise tax.
Japan	6	None.
Korea	30	Subject to regulations that are announced separately by the Office of Industrial Advancement Administration.
Malaya	None	None.
Taiwan	16	Imports are subject to licensing.
Iran	10	Registration-of-order fee of 1% invoice value; unloading fee of 80 rials per metric ton (M.T.); porterage charges of 320 rials per M.T.; other services fee of 40 rials per M.T.; municipality tax of 6% of duty and commercial benefit tax (cbt); red lion and sun society tax of 1.5% of duty and cbt; cooperative tax of 1% to 1.5% depending

See footnotes at end of table.

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Physical testing instruments: Current rate of duty and possible nontariff barriers, by countries--Continued

Country	Current rate of duty (percent ad valorem)	Possible nontariff barriers to trade
		on port; health tax of 5 rials per M.T.; goods released from Teheran Customs House pay 30 rials per M.T. as asphalt tax; airport tax at Mehrabad Airport is 15 rials per kg.
Israel----------	10	Surcharge of 15% on c.i.f. value; Stevedoring tariff (varies with size of container or box); purchase tax (not published in English, can be obtained by writing to the American Embassy in Israel); value added tax of 8% based on landed cost plus Customs tariff.
Saudi Arabia---------	30	5% surcharge. This surcharge does not apply to Government procured imports.
South Africa---------	None	None.

1/ Member of the European Economic Community (EEC).
2/ Member of the European Free Trade Association (EFTA).

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APPENDIX A

STATISTICAL TABLES

Table 1.--Machines and appliances for determining the strength of articles and parts thereof: U.S. rates of duty, by TSUS items, August 31, 1963, to present

(Percent ad valorem)

TSUS item No.	Description	Authorization effective date of rate changes	Rate of duty	
			Col. 1	Col. 2
711.25	Machines and appliances for determining the strength of articles or materials under compression, tension, torsion, or shearing stress and parts thereof----------	Adoption of TSUS; Aug. 31, 1963----------	14.5%	40%
		Pres. Proc. (Kennedy round); Jan. 1-- 1968----------	13%	40%
		1969----------	11.5%	40%
		1970----------	10%	40%
		1971----------	8.5%	40%
		1972----------	7%	40%

Source: Compiled from information contained in the Tariff Schedules of the United States Annotated (1976), Publication 749.

Table 2.--Physical testing instruments: U.S. shipments, exports, imports, and apparent consumption, 1968-76

Year	Shipments 1/	Exports	Imports	Apparent consumption	Ratio of imports to shipments	Ratio of imports to consumption	Ratio of exports to shipments
	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars	Percent	Percent	Percent
1968	26,200	4,936	1,118	22,382	4.3	5.0	18.8
1969	27,800	5,808	1,452	23,445	5.2	6.0	20.9
1970	29,400	6,446	1,010	23,964	3.4	4.2	21.9
1971	31,200	6,012	1,425	26,613	4.6	5.4	19.3
1972	33,100	8,946	1,187	25,341	3.6	4.7	27.0
1973	35,000	8,589	1,362	27,764	3.9	4.9	24.6
1974	33,600	10,900	1,692	24,392	5.0	6.9	32.4
1975	40,500	12,956	1,739	29,289	4.3	5.9	32.0
1976	45,500	13,473	2,648	34,675	5.8	7.6	29.6

1/ Estimated from information supplied by industry sources.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

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Table 3.--Physical testing instruments: 1/ U.S. exports of domestic merchandise, by principal markets, 1968-76

Market	1968	1969	1970	1971	1972	1973	1974	1975	1976
	Value (1,000 dollars)								
Canada	995	1,265	807	1,001	1,200	1,267	1,420	1,654	1,729
United Kingdom	556	883	368	438	819	634	846	995	1,190
Mexico	370	310	362	186	380	269	587	462	1,172
France	390	267	457	360	521	432	432	856	1,135
Japan	229	594	587	669	1,161	1,625	1,262	1,239	1,081
Brazil	226	220	249	269	524	405	583	485	606
West Germany	381	277	391	343	230	334	364	763	498
U.S.S.R.	-	12	32	23	11	-	34	1,001	383
Yugoslavia	-	11	-	12	20	11	-	754	371
Australia	226	97	138	108	99	251	269	250	366
Malaya	-	-	-	-	-	-	55	126	303
Argentina	92	90	53	38	77	138	364	183	258
Venezuela	67	381	202	153	127	162	113	252	254
Sweden	60	23	178	131	122	72	86	109	235
Saudi Arabia	13	32	29	14	37	20	60	62	234
Spain	47	30	156	335	241	327	272	256	228
Republic of Korea	32	88	113	129	128	184	65	223	228
Netherlands	55	32	65	81	277	190	225	161	216
Republic of China	59	82	94	254	298	85	179	133	213
All other	1,139	1,114	2,166	1,466	2,676	2,173	3,684	2,992	2,773
Total	4,937	5,808	6,447	6,010	8,948	8,579	10,900	12,956	13,473
	Percent of total								
Canada	20	22	13	17	13	15	13	13	13
United Kingdom	11	15	6	7	9	7	8	8	9
Mexico	7	5	6	3	4	3	5	4	9
France	8	5	7	6	6	5	4	7	8
Japan	5	10	9	11	13	19	12	10	8
Brazil	5	4	4	4	6	5	5	4	4
West Germany	8	5	6	6	3	4	3	6	4
U.S.S.R.	-	2/	1	2/	2/	-	2/	8	3
Yugoslavia	-	2/	-	2/	2/	2/	-	6	3
Australia	5	2	2	2	1	3	2	2	3
Malaya	-	-	-	-	-	-	1	2/	2
Argentina	2	2	1	1	1	2	3	1	2
Venezuela	1	7	3	3	1	2	1	2	2
Sweden	1	2/	3	3	1	1	1	2/	2
Saudi Arabia	2/	1	2/	2/	2/	2/	1	2/	2
Spain	1	2/	2	6	3	4	2	2	2
Republic of Korea	1	2	2	2	2	2	1	2	2
Netherlands	1	2/	1	1	3	2	2	1	2
Republic of China	1	1	1	4	3	1	2	1	2
All other	23	19	33	24	31	25	34	23	18
Total	100	100	100	100	100	100	100	100	100

1/ Include Schedule B No. 711.2440 (formerly 861.9500).
2/ Less than 0.5 percent.

Source: Compiled from official statistics of the U.S. Department of Commerce.

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Table 4.--Physical testing instruments: 1/ U.S. imports for consumption, 1968-76

Source	1968	1969	1970	1971	1972	1973	1974	1975	1976
	Value (1,000 dollars)								
France	-	-	23	56	42	85	64	44	784
West Germany	343	596	284	539	440	449	568	534	743
United Kingdom	247	325	277	345	358	325	410	371	350
Japan	108	108	52	50	77	83	137	160	301
Switzerland	251	202	237	232	103	129	157	145	181
Italy	29	44	44	31	31	49	98	97	109
Canada	26	33	11	124	103	142	165	154	59
Austria	42	21	24	12	8	61	30	45	33
Norway	16	52	22	7	2	5	17	17	30
Netherlands	15	5	18	5	3	9	-	36	9
Sweden	18	63	4	15	15	15	28	23	6
Belgium	-	-	3	2	-	1	1	92	1
All other	23	3	11	7	5	9	17	21	42
Total	1,118	1,452	1,010	1,425	1,187	1,362	1,692	1,739	2,648
	Percent of total								
France	-	-	3	4	4	7	4	3	30
West Germany	31	41	28	39	37	33	34	31	28
United Kingdom	22	22	27	24	30	24	24	21	13
Japan	10	7	5	4	6	7	8	9	11
Switzerland	22	14	23	16	9	9	9	8	7
Italy	3	4	4	2	3	4	6	6	4
Canada	2	2	2	9	9	10	10	9	2
Austria	4	2	2	1	1	4	2	3	1
Norway	1	4	2	2/	2/	2/	1	1	2
Netherlands	1	2/	2	2/	2/	1	-	2	2/
Sweden	2	4	2/	1	1	1	2	1	2/
Belgium	-	-	2/	2/	-	2/	2/	5	2/
All other	2	2/	2	2/	2/	2/	2/	1	2
Average	100	100	100	100	100	100	100	100	100

1/ Includes TSUS item No. 711.25.
2/ Less than 0.5 percent.

Source: Compiled from official statistics of the U.S. Department of Commerce.

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Table 5.--Physical testing instruments: TSUS number, schedule B number, SIC numbers, SITC number, and CCCN (BTN) number included in this commodity group 1/

TSUS item No.	Schedule B No.	SIC No.	SITC No.	CCCN (BTN) No.
711.25	711.2440 /formerly 861.9500/ (85%)	3829231 3829255	874.53	90.22

1/ Percentage allocation to commodity group is shown in parentheses.

APPENDIX B

PARTIAL LIST OF PHYSICAL TESTING INSTRUMENTS

Physical testing instruments: Partial list according to end use

Metal testing instruments	Plastic and rubber testing instruments	Textile testing instruments	Paper testing instruments	Construction materials testing instruments and others
Rockwell hardness tester	Impact tester	Bursting strength tester	Bursting strength tester	Cement and concrete tester
Brinell hardness tester	Tearing tester	Tensile tester	Crushing tester	Brick flexture tester
Vicker hardness tester	Compression tester	Tearing tester	Folding endurance tester	Wallboard abrasion tester
Knoop hardness tester	Abrasion tester	Abrasion tester	Tearing tester	Wallboard puncture tester
Micro hardness tester	Bending resistance tester	Elongation tester	Puncture tester	Nail and screw pulling tester
Sclerometer	Brittleness tester	Rubbing (crocking) for coated fabrics tester	Dynamic ball tester for sheets	Gluability tester
Durometer	Strength and elongation tester	Single strand strength and elongation tester	Paper roll hardness tester	Adhesion, ply tester
Shear tester	Elasticity tester	Softness-stiffness tester	Ply-bond strength tester	Bursting tester
Tensile tester	Hardness tester	Other	Penetration tester	Food texture measurement tester
Ductility tester	Softness-stiffness tester		Other	Other
Fatique tester	Folding endurance tester			
Stress/rupture tester	Plastometer			
Creep and stress tester	Foam rubber and foam plastic compression tester			
Impact tester	Film strength tester			
Strain tester	Adhesion for tire tester			
Cleat tester	Residual strain in rubber tester			
Folding endurance tester	Deformation tester			
Spring tester	Rheometer			
Tube crush tester	Resiliometer			
Rupture tester	Other			
Coil tester				
Chain cable tester				
Other				

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APPENDIX C

EXCERPTS FROM THE TARIFF SCHEDULE OF THE UNITED STATES ANNOTATED (1976)

GSP	Item	Stat. Suf-fix	Articles	Units of Quantity	Rates of Duty 1	Rates of Duty 2
			Subpart D. - Measuring, Testing, and Controlling Instruments			
			Subpart D headnotes:			
			1. The provisions of this subpart covered by items 711.00 to 711.88, inclusive, do not apply to electrical measuring, checking, analyzing, or automatically-controlling instruments or apparatus, as defined in headnote 2 below.			
			2. For the purposes of this subpart, the provisions herein (items 712.00 to 712.99, inclusive) for "electrical measuring, checking, analyzing, or automatically-controlling instruments and apparatus" apply only to the following articles: (a) appliances, instruments, apparatus, or machines of kinds described in subpart C of this part or in the provisions of this subpart (subpart D) covered by items 711.00 to 711.88, inclusive, the operation of which depends on an electrical phenomenon which varies according to the factor to be ascertained or automatically controlled; (b) instruments or apparatus for measuring or checking electrical quantities; and (c) instruments or apparatus for measuring or detecting alpha, beta, gamma, X-ray, cosmic, or similar radiations.			
			Balances of a sensitivity of 5 centigrams or better, with or without their weights, and parts thereof; weights suitable for use with such balances and sets of weights containing any such weights:			
A	711.04	00	Jewelers' balances and parts thereof	X	9.5% ad val.	45% ad val.
A	711.08	00	Other	X	12.5% ad val.	40% ad val.
A	711.25	00	Machines and appliances for determining the strength of articles or materials under compression, tension, torsion, or shearing stress, and parts thereof	X	7% ad val.	40% ad val.
			Hydrometers and similar floating instruments; thermometers, pyrometers, barometers, hygrometers, and psychrometers, whether or not recording instruments; any combination of the foregoing instruments; and articles in which one or more of such instruments are incorporated as significant integral parts and which are ordinarily used in the home or office where they are usually hung on the wall, or placed on mantels, shelves, or furniture:			
A*	711.30	00	Hydrometers and similar floating instruments, whether or not incorporating thermometers	X	21% ad val.	85% ad val.

Note: For explanation of the symbol "A" or "A*" in the column entitled "GSP", see general headnote 3(c).

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SUMMARIES OF TRADE AND TARIFF INFORMATION

USITC Publication

Complete list of Summaries published to date in Schedule 7

Control No.	Title	Control No.	Title
7 - 1 - 1	Luggage		
7 - 9 - 2	Fireworks		

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